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Korean Science Teachers' Understanding of Creativity in Gifted Education

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With the passing of Korea's Gifted Education Act, creativity has come to the forefront in considering the future of Korea's economic prosperity in the global economy (Korean Educational Development Institute, 2003). The purpose of this study was to examine the understanding of creativity among Korean science teachers of gifted students. Sixty teachers participated in this study with an open-ended questionnaire about their understanding of creativity. The data were analyzed based on Urban's (1995) three components of creativity. The findings indicated that these science teachers had a thorough understanding of the cognitive component and a strong association of creativity with intellectual ability, but overidentified with the cognitive component, showing less awareness of the personal and environmental components of creativity. To shift their understanding to a more balanced view, personality and environmental components, as well as attributes in other component areas, should be emphasized.

Recently, fostering creativity among gifted students has come to the forefront as an important element in the future of Korea's economic prosperity in the global economy. The Korean government passed a gifted education act in April 2002 that initiated gifted programs in every elementary, middle, and high school in the country (Korean Educational Development Institute, 2003). Korean gifted education has focused primarily on mathematics and science, and those departments are highly interested in creativity because ingenuity in those fields is tied to fiscal prosperity and competition within the global economy. According to the June 2003 report from the Korean Educational Development Institute, 0.28% of the entire elementary, middle, and high school student population, including public and private schools in Korea, were identified as gifted and were served by the gifted program. Eighty-two percent of them were receiving science and mathematics gifted education (42.8% science; 39.2% mathematics), whereas 18% were receiving information technology, music and arts, and English gifted education.

The Gifted Education expansion in Korea is still relatively new, and there is yet to be a single, uniform construct for giftedness, creativity, and selection of students for gifted programs. At this point, the definition of giftedness is fairly eclectic (Lee, 2004), borrowing from Marland (1972), Renzulli (1978), Gardner (1983), and Sternberg (1999). Student selection is contradictory to a national agenda that embraces creativity because it is limited to academic achievement only. The criteria for identification are students' GPAs, entrance exam scores, or high achievement scores within specific gifted areas.

Literature Review

Eastern and Western Views of Creativity

Generally, most studies have adopted the modern Western concept of creativity. Eastern people, however, hold a different view. This discrepancy is found among both researchers and laypersons (Niu & Sternberg, 2002). Westerners often focus on a person;s ability to generate creative products (Hughes & Drew, 1984). In contrast, Easterners view creativity as a state of personal fulfillment and the understanding or expression of an inner sense of ultimate reality (Chu, 1970; Kuo, 1996; Mathur, 1982), with a focus on meditation (Sarnoff & Cole, 1983). It could be said that Easterners tend to see creativity as a reinterpretation of ideas, while Westerners see creativity as a break from tradition (Kristeller, 1983). This study will focus on the Western view of creativity because of the connection between creativity, invention, and national economic prosperity (Torrance, 1992) and because such prosperity is the goal of gifted education in Korea.

Throughout Eastern and Western views, however, researchers, theorists, and philosophers seem to view creativity consistently as a multifaceted construct. Rhodes's (1961) approach uses the four P's of creativity—product, process, person, and press—to explain its multifaceted nature and to describe the conditions for creative success. "Product" includes the ideas expressed in the form of language or craft; "process" describes the mental processes that are operative in creating ideas, which include preparation, incubation, illumination, and verification (Wallas, 1926/1970); "person" includes cognitive abilities, biographic traits, and personality; and "press" describes the relationship between a person and his or her environment (Rhodes).

Explicit and Implicit Theories of Creativity

Two conventional approaches to the study of creativity involve a look at implicit and explicit theories (Sternberg, 1985). In studies using explicit theories, psychologists or other experts assess creativity in order to test their own hypotheses (e. g., Niu & Sternberg, 2002; Sternberg & Lubart, 1995; Torrance, 1966, 1974). In studies that involved implicit theories, psychologists, teachers, laypersons, or others are questioned about their views of creativity. Both approaches are useful in studying the nature of creativity and complement each other, providing a broad understanding of creativity (Niu & Sternberg, 2002).

This study examined creativity through a focus on implicit theories, which have been the subject of increased interest in recent years (Lim & Plucker, 2001). Implicit theories may help with cross-cultural research on creativity because they tend to reflect cultural perspectives (Ruzgis & Grigorenko, 1994). Some studies involving East Asian people have found indications that there is a cultural influence in the understanding and expression of creativity; that is, there are differences between East Asian people and Americans (e.g., Chan & Chan, 1999; Cheng, 1998; Lim & Plucker; Rudowicz & Hui, 1997; Rudowicz, Hui, & Ku-Yu, 1995; Rudowicz & Yue, 2000).

Three Components of Creativity

Urban (1995) classified creativity into three components: the cognitive aspect, personality, and the environmental condition. The cognitive aspect includes divergent thinking, general knowledge, and domain-specific knowledge and skills. Many researchers agree with threshold theory, which explains that creativity and intelligence are separate constructs; that is, more intelligence does not necessarily mean greater creativity. Threshold theory assumes that, below a critical IQ level, which is usually said to be about 120, there is some correlation between IQ and creative potential, while above it there is not (Barron, 1961; Getzels & Jackson, 1962; MacKinnon, 1962, 1967; Simonton, 1994; Yamamoto, 1964). Guilford (1956, 1959, 1960, 1986) considered creative thinking as involving divergent thinking, which emphasizes fluency, flexibility, originality, and elaboration. Guilford, however, noted that creative thinking is not the same as divergent thinking because creativity requires sensitivity to problems, as well as redefinition abilities, which include transformations of thought, reinterpretations, and freedom from functional fixedness in driving unique solutions.

Personality includes task commitment, motivation, and openness and tolerance for ambiguity. Creative people tend to be aware of their own creativity (Walberg, 1988; Walberg & Herbig, 1991) and childlike and open-minded (Dacey, 1989; Barron, 1988; Tardif & Sternberg, 1988; Walberg; Walberg & Herbig), and they also tend to have a playful and humorous approach to problem solving (Fabun, 1968; Getzels & Jackson, 1962). Additionally, they tend to be perceptive (Tardif & Sternberg, 1988), independent (Chambers, 1964; Eiduson, 1962; Rushton, Murray, & Paunonen , 1987), original (Tardif & Sternberg), risk-taking (Davis, Peterson, & Farley, 1973; Farley, 1986; Zuckerman, 1975), and curious (Eiduson).

The environmental condition includes individual, local, and global dimensions. According to Rhodes (1961), press includes the relationship between a person and his or her environment. The personal, process, and product elements of creativity must be valued within the social and cultural realm of the creator. If the person's social and cultural conditions do not value creativity, or even reproach it, creative growth cannot flourish. Rogers (1954/1976) emphasized the importance of setting up situations of psychological safety and freedom as preconditions for creativity. Some barriers that may limit conditions for creativity include habitual ways of thinking; restrictive rules and traditions that limit personal, social, and institutional behavior; emotional blocks, which can include insecurities, especially fear of failure, ridicule, and being different; and cultural blocks such as social influence, expectations, and conformity pressures (Davis, 1992; Torrance, 1963, 2002).

Fielding (1997) explained the importance of cultural influences on creativity. People interpret their world through their cultural artifacts, ideas, and beliefs, and their own creative expressions are developed within the culture. Cross-cultural studies can illustrate the importance of culture's influence upon creativity, highlighting ways culture and creativity interact. Such studies (e.g., Kim, 2004; Lim & Plucker, 2001; Lubart, 1990, 1999; Rudowicz & Hui, 1997; Sternberg & Lubart, 1999; Yue & Rudowicz, 2002) have shown the cultural diversity of the expression of creativity, as well as the extent to which a culture values such expression.

Teachers who wish to foster creativity among their pupils may find better results if their own understanding of creativity reflects the complexity of the concept itself. Any effort to facilitate creativity in education must take the role of teachers into account because they play an important part in helping to develop the creative potential of students (Chan & Chan, 1999; Diakidoy & Kanari, 1999). Theories about teachers' understandings of creativity should be recognized because they provide the basis of teachers' identification and the facilitation of creativity within the classroom. Previous research revealed that there might also be a cultural context for teachers' understandings (Chan & Chan, 1999). Within implicit theories of creativity, we classified science teachers' understandings of creativity according to Urban's (1995) three components. The purposes of this study were to examine teachers' understanding and to provide useful information for the improvement of science education for the gifted.

Method

Sample

The participants for the present study were 66 science teachers who enrolled in the 60-hour Summer In-Service Teachers Training Program for Gifted Education in Science, July 30 to August 10, 2002. This program is one of the teachers' professional development programs and was developed by Korean Educational Development Institute with the support of the Ministry of Education in Korea (Korean Educational Development Institute, 2003). The 66 science teacher participants came from all over the country because they were either currently teaching the gifted in science in middle and/or high school or they would soon be doing so. These teachers' years of teaching the gifted in science was 1 or 2 years at maximum.

Of the 66 teachers, 60 responded to the survey. Twenty of them (33.3%) were female teachers. The participants' teaching experience in middle school before they started teaching the gifted varied from 3 to 25 years. Their average years of teaching were 15.80 for total group, 17.55 for males, and 10.86 for females. The teachers had not experienced gifted education training before this particular session and questionnaire. Because Korean public middle and high school teachers rotate among middle and high schools every 4 years, each teacher could teach either at the middle or high school level.

Instrument and Data Analysis

Prior to the training, the teachers were asked to answer an open-ended question about how they defined creativity. Their responses were analyzed by employing a qualitative content analysis method (Spiel & von Korff, 1998). As a reference, we used Urban's (1995) three components of creativity (cognitive, personal, and environmental).

The unit of analysis was the whole answer of each respondent. We developed a vocabulary pool containing association and keywords typical for each component. For example, *originality*, *fluency*, and *flexibility* were categorized into the cognitive component, while *concentration* and *consistency* were categorized into the personal component. The pool was enriched by words in the respondents' answer. For example, *new* or "something that no other person can do" were viewed as representing originality. We coded each answer according to Urban's three components of creativity. For reliability, coding was independently done by three researchers. When the results were reviewed, any difference was reexamined and fully

Table 1

Science Teachers' Understanding of Creativity

	Component			Response	
View	Cognitive	Personal	Environmental	*N*	(%)
Biased	Originality	–	-	25	(41.7)
	Thinking Skill	–	-	4	(6.7)
	–	Task commitment	-	1	(1.7)
	–	–	Social value	4	(6.7)
	Originality + Problem Solving	–	-	11	(18.3)
	Originality + Thinking Skill	–	-	1	(1.7)
			Subtotal	46	(76.7)
Transitional	Originality	Challenge	-	1	(1.7)
	Problem Solving	Motivation	-	3	(5.0)
	Originality	–	Social value	9	(15.0)
			Subtotal	13	(21.6)
Balanced	Problem Solving	Challenge	Social value	1	(1.7)
			Subtotal	1	(1.7)
			Total	60	

discussed before final coding was made. Here are some examples:

Example 1: Creativity is to produce something new and useful. In this answer, we decided that *new* indicated originality and *useful* indicated appropriateness in social context. Thus, it was coded into the both the cognitive and environmental components.

Example 2: Creativity is an ability to think of things that no other person can. In this answer, we detected *thinking ability* and *uniqueness*. Therefore, it was coded to represent only the cognitive component.

Response categorization was determined by the number of components included in the respondent's answer. For example, teachers who mentioned all three components of creativity were grouped into the "balanced view" category, whereas teachers who mentioned two components of creativity were grouped into the "transitional view" category. Teachers who mentioned only one component were grouped into the "biased view" category. In addition, two independent variables of gender and years of teaching experience were included in the analysis.

Results

The results indicated that 76.7% of the teachers expressed a biased view of creativity, while 21.6% indicated a transitional view as shown in Table 1. Only one of the teachers showed a balanced view by including all three components of creativity. There are many attributes in each component. Most of the teachers (78.3%) mentioned originality across the three views. For the cognitive component, originality, problem solving, and thinking ability were frequently mentioned. For the environmental component, teachers often mentioned social value. Only 1 teacher mentioned task commitment, one teacher wrote about motivation, and 2 teachers mentioned challenge to explain personal components of creativity. As a result, the personal component was the least mentioned.

Table 2 shows the result of the analysis based on gender. Among teachers who expressed a biased view, there

Table 2

Male and Female Teachers' Understandings of Creativity

Gender	No. of teachers	Biased	(%)	Transitional	(%)	Balanced	(%)
Male	40	27	(67.5)	12	(30.0)	1	(2.5)
Female	20	19	(95.0)	1	(5.0)	0	(0.0)
Total	60	46	(76.7)	13	(21.7)	1	(1.7)

were 27 male teachers and 19 female teachers. Among 13 teachers who expressed a transitional view, there were 12 male teachers and 1 female teacher. There was only 1 male teacher who expressed a balanced view. The Pearson correlation coefficient between gender and views was statistically significant ($r = .30$, $p < .05$), which indicated that female teachers had a more biased view.

In terms of years of teaching experience, the results are shown in Table 3. Among the 13 teachers who expressed a transitional view, the highest percentage (38.5%) had teaching experience of 16–20 years. The only teacher who expressed a balanced view also had teaching experience of 16–20 years. The Pearson correlation coefficient between years of teaching experience and views was statistically not significant ($r = .07$, $p > .05$).

Discussion

Science teachers who participated in this study seemed to be well aware of the cognitive component of creativity, with all teachers (60 of 60 teachers) mentioning it. They described intellectual abilities such as originality, problem solving, and thinking ability as important attributes to creativity. Meanwhile, no teachers in this study mentioned knowledge: none seemed to think that knowledge was an important factor in creativity. In a previous study by Diakidoy and Kanari (1999), it was also reported that student teachers did not think prior knowledge was a factor of creativity. Originality was the most frequently mentioned attribute of the cognitive component, and 41.7% seemed to think that creativity was merely originality. These findings are consistent with the results of Spiel and von Korff's (1998)study, which reported that teachers mostly associated "novelty" with creativity. Furthermore, the findings of the present study that teachers mentioned problem solving (25.0%) and thinking ability (8.3%) implied that the participants associated intellectual ability with creativity. Chan and Chan (1999) surveyed Hong Kong teachers' understanding of creativity and found that they showed a similar association between intellectual ability and creativity.

The participants largely neglected the components of personality, thus underestimating the importance of students' personal characteristics in facilitating creativity. On the other hand, the environmental component was identified only as social values. All other attributes of the environmental component, such as cultural background, social circumstance, and individual circumstance, were neglected. It seemed that these teachers thought appropriateness or acceptance in the social community was very important in facilitating creativity. A similar tendency has been reported from the study of Chinese people's understanding of creativity (Rudowicz & Hui, 1997; Rudowicz, Hui, & Ku-Yu, 1995). In these studies, some components of creativity important ~~in the Western~~ conception, such as "aesthetic appreciation" and "humor," were missing, whereas participants mentioned "contribution to the progress of society" and "inspiring people" as important factors in creativity, which were terms that were not reported in the U.S. studies (Rudowicz, Hui, & Ku-Yu).

Several explanations have been offered for the cultural differences between Eastern and Western people in their conceptions of creativity. One explanation is that Chinese culture emphasizes more collectivist values than does Western culture (e.g., Chan & Chan, 1999; Rudowicz & Yue, 2000). Researchers have reported an association between collectivism and social conformity (Crittenden, Fugita, Bae, Lamug, & Lin, 1992; Martinsons & Martinsons, 1996). In Western societies, liberal moral-political values emphasize individuals' rights and self-determination. In contrast, Confucianism in East Asia emphasizes the collective good and harmony, along with self-cultivation and self-regulation (Park & Kim, 1999). In Eastern societies, the welfare of the group is seen as inseparable from that of the individual, while Western societies emphasize the rights of the individual, even at the expense of the group (Averill, Chon, & Hahn, 2001). Confucianism emphasizes conformity and acting predictably within a situational context. Adherence to group interests for the sake of achieving harmony is often justi-

Table 3

Teaching Experience and Understanding of Creativity

Years of Teaching	No. of teachers	Biased	(%)	Transitional	(%)	Balanced	(%)
5 or less	5	4	(80.0)	1	(20.0)	0	(0.0)
6–10	8	6	(75.0)	2	(25.0)	0	(0.0)
11–15	18	15	(83.3)	3	(16.7)	0	(0.0)
16–20	21	15	(71.4)	5	(23.8)	1	(4.8)
21–25	8	6	(75.0)	2	(25.0)	0	(0.0)
Total	60	46	(76.7)	13	(21.7)	1	(1.7)

fied at the expense of individual interests (Chung, 1994; Kim, 2004).

There were also differences according to gender and teaching experience. According to our findings, more male teachers showed a balanced understanding of creativity than female teachers. This difference implies that male teachers may be more open to various aspects of creativity when compared with female teachers. There might be gender-based differences in teachers' implicit theories of creativity, but such a conclusion would require confirmation through other studies, especially because only 33.3% of the participants were females in this study. In this study, teachers' views did not seem to be influenced by their years of teaching experience.

The findings indicate that Korean science teachers' understanding of creativity emphasized only cognitive components, while they largely ignored personality and environmental components. In order to encourage creativity, we should also be aware of creative personality traits and should remove environmental and cultural blocks that inhibit creativity. Teachers who express a biased view of creativity may be more likely to emphasize a limited aspect of creativity among their students that reflects that bias. Such a tendency may limit a student's potential, especially if that student has a tendency to express him- or herself creatively and has beliefs that differ from the teacher's. This could result in failure within both regular and gifted classes. All components of creativity are important. An incomplete understanding of creativity, where some elements are absent, misunderstood, or misrepresented is insufficient because the balance among those components is helpful in teaching gifted students.

The importance of educating our educators becomes apparent when we see that participants in this study were either currently teaching gifted science classes or would soon be doing so and that 98.3% of them did not have a balanced view of creativity. Because these teachers' expertise has been in gifted education in science for only 1 or 2 years, more creativity training is greatly needed. In order to broaden teachers' understanding of creativity, not only should product and process components be focused on, but environmental and personality components must also be emphasized. Further, these findings imply that future professional development programs for teachers of gifted science classes should include a well-rounded focus on all elements of creativity, including product and process. Teachers who possess a balanced view of creativity should have a positive impact on science education for the gifted. We expect that a broader understanding of creativity will also have a positive influence on science education in general because these teachers also teach in mainstream classrooms.

This study provides only one glimpse of Korean gifted education and cannot be generalized because the sample size was too small and had fewer females than males. The results of this study should be considered tentative until future studies with larger sample sizes confirm the findings. Furthermore, a study of the relationship between response patterns and classroom behaviors would also be helpful. Further studies will be needed to probe the cultural and gender-based differences in teachers' understandings of creativity, which will provide more information about teachers' implicit theories of creativity, as well as improve their professional development programs.

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